What is claimed is:

1 A sound source apparatus having operation blocks composed of softwares used to compute waveforms for generating a plurality of musical tones through a plurality of channels according to performance information, the apparatus comprising:

a setting device for setting an algorithm which determines a system composed of selective ones of the operation blocks systematically combined with each other to compute a waveform specific to one of the musical tones;

a designating device responsive to the performance information for designating one of the channels to be used for generating said one musical tone; and

a generating device for allocating the selective operation blocks to said one channel and for systematically executing the allocated selective operation blocks according to the algorithm so as to compute the waveform to thereby generate said one musical tone through said one channel.

2 A sound source apparatus according to claim 1, wherein the setting device sets different algorithms which determine different systems corresponding to different timbres of the musical tones, each of the different systems being composed of selective ones of the operation blocks which are selectively and sequentially combined with each other to compute a waveform which is specific to a corresponding one of the different timbres.

3 A sound source apparatus according to claim 2, wherein the setting device comprises a determining device that determines a first system

99

combining a great number of operation blocks and corresponding to a regular timbre and that determines a second system combining a small number of operation blocks and corresponding to a substitute timbre, and a changing device operative when a number of operation blocks executable in the channel is limited under said great number and over said small number due to a load of the computation of the waveform for changing the musical tone from the regular timbre to the substitute timbre so that the second system is adopted for the channel in place of the first system.

4 A sound source apparatus according to claim 1, wherein the setting device comprises an adjusting device operative dependently on a condition during the course of generating the musical tone for adjusting a number of the operation blocks to be allocated to the channel.

5 A sound source apparatus according to claim 4, wherein the adjusting device comprises a modifying device that modifies the algorithm to eliminate a predetermined one of the operation blocks involved in the system so as to reduce a number of the operation blocks to be loaded into the channel for adjustment to the condition.

6 A sound source apparatus according to claim 4, wherein the adjusting device operates when the condition indicates that an amplitude envelope of the waveform attenuates below a predetermined threshold level for compacting the system so as to reduce the number of the operation blocks.

7 A sound source apparatus according to claim 4, wherein the adjusting device operates when the condition indicates that an output volume of the musical tone is tuned below a predetermined threshold level for compacting the system so as to reduce the number of the operation blocks.

8 A sound source apparatus according to claim 4, wherein the adjusting device operates when the condition indicates that one of the operation blocks declines to become inactive in the system without substantially affecting other operation blocks of the system for eliminating said one operation block so as to reduce the number of the operation blocks to be allocated to the channel.

9 A sound source apparatus according to claim 1, wherein the generating device comprises a computing device responsive to a variable sampling frequency for executing the operation blocks to successively compute samples of the waveform in synchronization to the variable sampling frequency so as to generate the musical tone, and a controlling device that sets the variable sampling frequency according to process of computation of the waveform by the operation blocks.

10 A sound source apparatus according to claim 1, wherein the generating device comprises a computing device responsive to a variable sampling frequency for executing the operation blocks to successively compute samples of the waveform in synchronization to the variable sampling frequency so as to generate the musical tone, and a controlling device for adjusting the variable sampling frequency dependently on a load of computation of the waveform during the course of generating the musical tone.

11 A sound source apparatus according to claim 1, wherein the generating device comprises a computing device responsive to a variable sampling frequency for executing the operation blocks to successively compute samples of the waveform in synchronization to the variable sampling frequency so as to generate the musical tone, and a controlling device for adjusting the variable sampling frequency according to result of computation of the samples during the course of generating the musical tone.

13. ~~12~~ A sound source apparatus having a software module used to compute samples of a waveform in response to a sampling frequency for generating a musical tone according to performance information, the apparatus comprising:

a processor device that periodically executes the software module for successively computing samples of the waveform corresponding to a variable sampling frequency so as to generate the musical tone;

a detector device for detecting a load of computation imposed on the processor device during the course of generating the musical tone; and

a controller device operative according to the detected load for changing the variable sampling frequency to adjust a rate of computation of the samples.

14. ~~13~~ A sound source apparatus according to claim ~~12~~ 13, wherein the controller device provides a fast sampling frequency when the detected load is relatively light, and provides a slow sampling frequency when the detected load is relatively heavy such that the rate of the computation of the samples is reduced by 1/n where n denotes an integer number.

15. 14

14 A sound source apparatus according to claim 13, wherein the processor device includes a delay device having a memory for imparting a delay to the waveform to determine a pitch of the musical tone according to the performance information, the delay device generating a write pointer for successively writing the samples into addresses of the memory and a read pointer for successively reading the samples from ~~adresses~~ addresses of the memory to thereby create the delay corresponding to an address gap between the write pointer and the read pointer, the delay device being responsive to the fast sampling frequency to increment both of the write pointer and the read pointer by one address for one sample, otherwise the delay device being responsive to the slow sampling frequency to increment the write pointer by one address n times for one sample and to increment the read pointer by n addresses for one sample.

16. 14

15 A sound source apparatus according to claim 13, wherein the processor device includes a delay device having a pair of memory regions for imparting a delay to the waveform to determine a pitch of the musical tone according to the performance information, the delay device successively writing the samples of the waveform of one ~~mucical~~ musical tone into addresses of one of the memory regions and successively reading the samples from addresses of the same memory region to thereby create the delay, the delay device being operative when said one musical tone is switched to another musical tone for successively writing the samples of the waveform of said another ~~mucical~~ musical tone into addresses of the other memory region and successively reading the samples from addresses of the same memory region to thereby create the delay while clearing the one memory region to prepare for a further musical tone.

17. 13
16 A sound source apparatus according to claim 12, wherein the processor device executes the software module composed of a plurality sub-modules for successively computing the waveform, the processor device being operative when one of the sub-modules declines to become inactive without substantially affecting other sub-modules during computation of the waveform for skipping execution of said one sub-module.

20.
17 A sound source apparatus having a software module used to compute samples of a waveform for generating a musical tone, the apparatus comprising:

a provider device for variably providing a trigger signal at a relatively slow rate to define a frame period between successive trigger signals, and for periodically providing a sampling signal at a relatively fast rate such that a plurality of sampling signals occur within one frame period;

a processor device resettable in response to each trigger signal and operable to periodically execute the software module for successively computing a number of samples of the waveform corresponding to the sampling signals within one frame;

a detector device for detecting a load of computation imposed on the processor device during the course of generating the musical tone;

a controller device operative according to the detected load for varying the frame period to adjust the number of the samples computed within one frame period, and

a converter device responsive to each sampling signal for converting each of the samples into a corresponding analog signal to thereby generate the musical tones.

21. ~~18~~ A sound source apparatus having submodules composed of softwares used to compute waveforms for generating a plurality of musical tones through a plurality of channels according to performance information, the apparatus comprising:

setting means for setting an algorithm which determines a module composed of selective ones of the submodules logically connected to each other to compute a waveform specific to one of the musical tones;

designating means responsive to the performance information for designating one of the channels to be used for generating said one musical tone; and

generating means for loading the selective submodules into said one channel and for logically executing the allocated selective submodules according to the algorithm so as to compute the waveform to thereby generate said one musical tone through said one channel.

22. ~~19~~ A sound source apparatus according to claim ~~18~~ 21, wherein the setting means sets different algorithms which determine different modules corresponding to different timbres of the musical tones, each of the different modules being composed of selective ones of the submodules which are selectively and sequentially connected to each other to compute a waveform which is specific to a corresponding one of the different timbres.

23. ~~20~~ A sound source apparatus according to claim ~~18~~ 21, wherein the setting means comprises adjusting means operative dependently on a condition during the course of generating the musical tone for adjusting a number of the submodules to be loaded into the channel.

24. ~~21~~ A sound source apparatus according to claim ~~18~~ 21, wherein the adjusting means operates when the condition indicates that an amplitude envelope of the waveform attenuates below a predetermined threshold level for compacting the module so as to reduce the number of the submodules.

25. ~~22~~ A sound source apparatus according to claim ~~18~~ 21, wherein the adjusting means operates when the condition indicates that an output volume of the musical tone is tuned below a predetermined threshold level for compacting the module so as to reduce the number of the submodules.

26. ~~23~~ A sound source apparatus according to claim ~~18~~ 21, wherein the adjusting means operates when the condition indicates that one of the submodules loses contribution to computation of the waveform without substantially affecting other submodules for eliminating said one submodule so as to reduce the number of the submodules to be loaded into the channel.

27. ~~24~~ A sound source apparatus having a software module used to compute samples of a waveform in response to a sampling frequency for generating a musical tone according to performance information, the apparatus comprising:

106

processor means to periodically execute the software module for successively computing samples of the waveform corresponding to a variable sampling frequency so as to generate the musical tone;

detector means for detecting a load of computation imposed on the processor means during the course of generating the musical tone; and

controller means operative according to the detected load for changing the variable sampling frequency to adjust a rate of computation of the samples.

28. ~~25~~ A sound source apparatus according to claim 27 ~~24~~, wherein the controller means provides a fast sampling frequency when the detected load is relatively light, and provides a slow sampling frequency when the detected load is relatively heavy such that the rate of the computation of the samples is reduced by 1/n where n denotes an integer number.

30. ~~26~~ A sound source apparatus according to claim 28 ~~25~~, wherein the processor means includes delay means having a memory for imparting a delay to the waveform to determine a pitch of the musical tone according to the performance information, the delay means generating a write pointer for successively writing the samples into addresses of the memory and a read pointer for successively reading the samples from addresses ~~adresses~~ of the memory to thereby create the delay corresponding to an address interval between the write pointer and the read pointer, the delay means being responsive to the fast sampling frequency to increment both of the write pointer and the read pointer by every one address for every one sample, otherwise the delay means being responsive to the slow sampling frequency to increment the write pointer by every one address at n times for repeatedly writing one sample into consecutive

107

n addresses and to skip the read pointer by consecutive n addresses for reading one sample.

31.

27 A sound source apparatus having a software module used to compute samples of a waveform for generating a musical tone, the apparatus comprising:

provider means for variably providing a trigger signal at a relatively slow rate to define a frame period between successive trigger signals, and for periodically providing a sampling signal at a relatively fast rate such that a plurality of sampling signals occur within one frame period;

processor means resettable in response to each trigger signal and operable based on each sampling signal to periodically execute the software module for successively computing a number of samples of the waveform within one frame period;

detector means for detecting a load of computation imposed on the processor means during the course of generating the musical tone;

controller means operative according to the detected load for varying the frame period to adjust the number of the samples computed within one frame period, and

converter means responsive to each sampling signal for converting each of the samples into a corresponding analog signal to thereby generate the musical tones.

32.

28 A sound source apparatus having a software module used to compute samples of a waveform for generating a musical tone, the apparatus comprising:

provider means for periodically providing a trigger signal at a relatively slow rate to define a frame period between successive trigger signals, and for periodically providing a sampling signal at a relatively fast rate such that a plurality of sampling signals occur within one frame period;

processor means resettable in response to a trigger signal and operable in response to each sampling signal to periodically execute the software module for successively computing a number of samples of the waveform within one frame period; and

converter means responsive to each sampling signal for converting each of the samples into a corresponding analog signal to thereby generate the musical tones, wherein

the processor means includes delay means having a pair of memory regions for imparting a delay to the waveform to determine a pitch of the musical tone according to the performance information, the delay means successively writing the samples of the waveform of one ~~mucical~~ musical tone into addresses of one of the memory regions and successively reading the samples from ~~adresses~~ addresses of the same memory region to thereby create the delay, the delay means being operative when the processor means is reset so that said one musical tone is switched to another musical tone for successively writing the samples of the waveform of said another ~~mucical~~ musical tone into addresses of the other memory region and successively reading the samples from ~~adresses~~ addresses of the same memory region to thereby create the delay while clearing the one memory region to prepare for a further musical tone.

33.

29 A method using submodules composed of softwares to compute waveforms for generating a plurality of musical tones through a plurality of

channels according to performance information, the method comprising the steps of:

setting an algorithm which determines a module composed of selective ones of the submodules logically connected to each other to compute a waveform specific to one of the musical tones;

designating one of the channels to be used for generating said one musical tone in response to the performance information;

loading the selective submodules into said one channel; and

logically executing the loaded selective submodules according to the algorithm so as to compute the waveform to thereby generate said one musical tone through said one channel.

34.
30 A method according to claim 29, 33 wherein the step of setting sets different algorithms which determine different modules corresponding to different timbres of the musical tones, each of the different modules being composed of selective ones of the submodules which are selectively and sequentially connected to each other to compute a waveform which is specific to a corresponding one of the different timbres.

35.
31 A method according to claim 29, 33 wherein the step of setting comprises adjusting a number of the submodules to be loaded into the channel dependently on a condition during the course of generating the musical tone.

36.
32 A method according to claim 31, 35 wherein the step of adjusting comprises compacting the module so as to reduce the number of the submodules when the

110

condition indicates that an amplitude envelope of the waveform attenuates below a predetermined threshold level.

37. 35
36 A method according to claim 31, wherein the step of adjusting comprises compacting the module so as to reduce the number of the submodules when the condition indicates that an output volume of the musical tone is tuned below a predetermined threshold level.

Subd 37 34 A method according to claim 31, wherein the step of adjusting comprises eliminating one submodule so as to reduce the number of the submodules to be loaded into the channel when the condition indicates that said one submodule loses contribution to computation of the waveform without substantially affecting other submodules.

39.
38 A method using a hardware processor and a software module to compute samples of a waveform in response to a sampling frequency for generating a musical tone according to performance information, the method comprising the steps of:

periodically operating the hardware processor to execute the software module for successively computing samples of the waveform corresponding to a variable sampling frequency so as to generate the musical tone;

detecting a load of computation imposed on the hardware processor during the course of generating the musical tone; and

changing the variable sampling frequency according to the detected load to adjust a rate of computation of the samples.

40. 39

36 A method according to claim 35, wherein the step of changing provides a fast sampling frequency when the detected load is relatively light, and provides a slow sampling frequency when the detected load is relatively heavy.

41.

37 A method using a hardware processor having a software module used to compute samples of a waveform for generating a musical tone, the method comprising the steps of:

variably providing a trigger signal at a relatively slow rate to define a frame period between successive trigger signals;

periodically providing a sampling signal at a relatively fast rate such that a plurality of sampling signals occur within one frame period;

operating the hardware processor resettable in response to each trigger signal and operable based on each sampling signal to periodically execute the software module for successively computing a number of samples of the waveform within one frame period;

detecting a load of computation imposed on the software processor during the course of generating the musical tone;

varying the frame period according to the detected load to adjust the number of the samples computed within one frame period, and

converting each of the samples into a corresponding analog signal in response to each sampling signal to thereby generate the musical tones.

42.

38 A method using a hardware processor having a software module used to compute samples of a waveform for generating a musical tone, the method comprising the steps of:

periodically providing a trigger signal at a relatively slow rate to define a frame period between successive trigger signals;

periodically providing a sampling signal at a relatively fast rate such that a plurality of sampling signals occur within one frame period;

operating the hardware processor resettable in response to a trigger signal and operable based on each sampling signal to periodically execute the software module for successively computing a number of samples of the waveform within one frame period; and

converting each of the samples into a corresponding analog signal in response to each sampling signal to thereby generate the musical tones, wherein

the step of operating includes delay step using a pair of memory regions for imparting a delay to the waveform to determine a pitch of the musical tone according to the performance information, the delay step successively writing the samples of the waveform of one ~~mucical~~ musical tone into addresses of one of the memory regions and successively reading the samples from ~~adresses~~ addresses of the same memory region to thereby create the delay, the delay step responding when the hardware processor is reset so that said one musical tone is switched to another musical tone for successively writing the samples of the waveform of said another ~~mucical~~ musical tone into addresses of the other memory region and successively reading the samples from ~~adresses~~ addresses of the same memory region to thereby create the delay while clearing the one memory region to prepare for a further musical tone.

43. 39 A machine readable media for use in a prrocessor machine including a CPU, said media containing program instructions executable by said CPU for

113

causing the processor machine having submodules composed of softwares to compute waveforms for performing operation of generating a plurality of musical tones through a plurality of channels according to performance information, wherein the operation comprises the steps of:

setting an algorithm which determines a module composed of selective ones of the submodules logically connected to each other to compute a waveform specific to one of the musical tones;

designating one of the channels to be used for generating said one musical tone in response to the performance information;

loading the selective submodules into said one channel; and

logically executing the loaded selective submodules according to the algorithm so as to compute the waveform to thereby generate said one musical tone through said one channel.

44. 43
~~40~~ A machine readable media according to claim ~~39~~, wherein the step of setting sets different algorithms which determine different modules corresponding to different timbres of the musical tones, each of the different modules being composed of selective ones of the submodules which are selectively and sequentially connected to each other to compute a waveform which is specific to a corresponding one of the different timbres.

45. 43
~~41~~ A machine readable media according to claim ~~39~~, wherein the step of setting comprises adjusting a number of the submodules to be loaded into the channel dependently on a condition during the course of generating the musical tone.

46. 45

42 A machine readable media according to claim 41, wherein the step of adjusting comprises compacting the module so as to reduce the number of the submodules when the condition indicates that an amplitude envelope of the waveform attenuates below a predetermined threshold level.

47. 45

43 A machine readable media according to claim 41, wherein the step of adjusting comprises compacting the module so as to reduce the number of the submodules when the condition indicates that an output volume of the musical tone is tuned below a predetermined threshold level.

c

Subst 44 A machine readable media according to claim 41, wherein the step of adjusting comprises eliminating one submodule so as to reduce the number of the submodules to be loaded into the channel when the condition indicates that said one submodule loses contribution to computation of the waveform without substantially affecting other submodules.

49.

45 A machine readable media for use in a processor machine including a CPU, said media containing program instructions executable by said CPU for causing the processor machine having a software module to compute samples of a waveform in response to a sampling frequency for performing operation of generating a musical tone according to performance information, wherein the operation comprises the steps of:

periodically operating the processor machine to execute the software module for successively computing samples of the waveform corresponding to a variable sampling frequency so as to generate the musical tone;

115

detecting a load of computation imposed on the processor machine during the course of generating the musical tone; and

changing the variable sampling frequency according to the detected load to adjust a rate of computation of the samples.

50. (~~46~~ 49) A machine readable media according to claim (~~45~~ 49), wherein the step of changing provides a fast sampling frequency when the detected load is relatively light, and provides a slow sampling frequency when the detected load is relatively heavy.

51. (~~47~~) A machine readable media for use in a processor machine including a CPU, said media containing program instructions executable by said CPU for causing the processor machine having a software module used to compute samples of a waveform for performing operation of generating a musical tone, wherein the operation comprises the steps of:

variably providing a trigger signal at a relatively slow rate to define a frame period between successive trigger signals;

periodically providing a sampling signal at a relatively fast rate such that a plurality of sampling signals occur within one frame period;

operating the processor machine resettable in response to each trigger signal and operable based on each sampling signal to periodically execute the software module for successively computing a number of samples of the waveform within one frame period;

detecting a load of computation imposed on the processor machine during the course of generating the musical tone;

varying the frame period according to the detected load to adjust the number of the samples computed within one frame period, and

converting each of the samples into a corresponding analog signal in response to each sampling signal to thereby generate the musical tones.

52.

48 A machine readable media for use in a processor machine including a CPU, said media containing program instructions executable by said CPU for causing the processor machine having a software module used to compute samples of a waveform for performing operation of generating a musical tone, wherein the operation comprises the steps of:

periodically providing a trigger signal at a relatively slow rate to define a frame period between successive trigger signals;

periodically providing a sampling signal at a relatively fast rate such that a plurality of sampling signals occur within one frame period;

operating the processor machine resettable in response to a trigger signal and operable based on each sampling signal to periodically execute the software module for successively computing a number of samples of the waveform within one frame; and

converting each of the samples into a corresponding analog signal in response to each sampling signal to thereby generate the musical tones, wherein

the step of operating includes delaying step using a pair of memory regions for imparting a delay to the waveform to determine a pitch of the musical tone according to the performance information, the delay step successively writing the samples of the waveform of one ~~mucical~~ musical tone into addresses of one of the memory regions and successively reading the samples

117

from ~~adresses~~ addresses of the same memory region to thereby create the delay, the delay step responding when the processor machine is reset so that said one musical tone is switched to another musical tone for successively writing the samples of the waveform of said another ~~mucical~~ musical tone into addresses of the other memory region and successively reading the samples from ~~adresses~~ addresses of the same memory region to thereby create the delay while clearing the one memory region to prepare for a further musical tone.

add a5

118